

AMENDMENTS TO THE SPECIFICATION:

Please amend the paragraph beginning at line 5 of page 3 as follows:

Conventionally, such methods are known as spreading respective monofilaments by subjecting multi-filament bundles to circular rods, and splitting respective monofilaments widthwise by water stream or high-pressurized air stream and ultrasonically vibrating respective monofilaments bundles so as to split the same. As for some examples of such method by the circular rods, it is disclosed in Japanese Patent Application Laid-open No.56-43435 that the multi-filament bundles are passed through and in engagement with ~~[[the]]~~ a revolving roller that vibrates in the axial direction thereof so as to be spread, and it is disclosed in Japanese After-Grant Patent Application Laid-open No. 3-31823 that the multi-filaments are passed through and in engagement with a plurality of rollers that are disposed in displacement by 30 degrees to 90 degrees to each other so as to be spread. Then, as for some examples of such method by water stream or high-pressurized air stream, it is disclosed in Japanese Patent Application Laid-open No.52-151362 that the multi-filament bundles are subjected to high-pressurized fluid so as to be spread, and it is disclosed in Japanese Patent Application Laid-open No.57-77342 that the multi-filament bundles in carriage are subjected to fluid flowing vertically with regard to the moving

direction of the former to apply dispersion force by such fluid to the former so as to be spread. Further, as for an example of such ultrasonic method as mentioned above, it is disclosed in Japanese Patent Application Laid-open No.1-282362 that the multi-filament bundles are put into contact with a circular rod ultrasonically vibrating in the axial direction thereof in a crosswise manner so as to be spread.

Please amend the paragraph beginning at line 19 of page 4 as follows:

Under the above circumstances, the subject inventors have proposed in Japanese Patent No.3049225 entitled 'Method of producing a spread fibers sheet and an apparatus used in the same' and in Japanese Patent No. 3064019 entitled 'Method of producing a spread multi-filaments sheet and an apparatus used in the same' wherein the multi-filament bundles in a flexibly bent condition are subjected to suction air flowing crosswise with regard to the moving direction of the multi-filament bundles ~~and crosswise with regard thereto~~ so as to spread the respective multi-filament bundles wider whose monofilaments are uniformly distributed in density. These methods are successful in spreading the respective multi-filament bundles wider whose monofilaments are distributed in density by bending the multi-filament bundles so as to put the monofilaments comprising the same into such

condition to facilitate the widthwise movement thereof without enforcement or to put the monofilaments into such condition as facilitating the same to be spread widthwise and by subjecting the monofilaments in such condition to suction air allowing air pass through the respective adjacent monofilaments.

Please amend the paragraph beginning at line 17 of page 6 as follows:

Firstly, the 'method of producing a spread multi-filament bundle' according to the invention is characterized in that a multi-filament bundle Tm fed from a yarn supplier [[1]] 11 (bobbin, cone, cheese and so forth) is passed through in suspension a plurality of fluid flowing portions 31a, 31b, 31c and so on respectively of the fluid flowing spreader 3 provided in series along the moving course of the bundle Tm [[o]] to be subjected to fluidal resistance so as to bend towards the direction to which a fluid flows , and such fluid flows through an interstice formed between the adjacent monofilaments of the bundle whose bonding of the adjacent monofilaments thereof being slackened due to such fluidal resistance so as to widen such interstice between the adjacent monofilaments thereof, thereby, further promoting spreading operation on the bundle, wherein the bundle Tm to be subjected to such spreading operation is passed through in succession the fluid flowing portion 31a located at

an upstream side and the respective fluid flowing portions 31b and 31c and so forth located at a downstream side so as to gradually enlarge contact area between the bundle Tm and such fluid, thereby, widely spreading the bundle Tm in a progressive manner.

Please amend the paragraph beginning at line 3 of page 7 as follows:

Then, the 'method of producing a spread multi-filament bundle' according to the invention is characterized in that the tensile force applied to a multi-filament bundle in carriage is fluctuated alternatively and repeatedly between tension and relaxation by locally and intermittently pressing a multi-filament bundle Tm fed from a yarn supplier ~~[[1]]~~ 11 widthwise with regard to the bundle Tm and the bundle Tm under such fluctuation is passed through in suspension a plurality of fluid flowing portions 31a, 31b, 31c and so on respectively of the fluid flowing spreader 3 provided in series along the moving course of the bundle Tm to be subjected to fluidal resistance so as to bend towards the direction to which a fluid flows, and such fluid flows through an interstice formed between the adjacent monofilaments of the bundle whose bonding is slackened due to such fluidal resistance so as to widen such interstice between the adjacent monofilaments thereof, thereby, further promoting

spreading operation on the bundle, wherein the bundle Tm to be subjected to such spreading operation is passed through in succession the fluid flowing portion 31a located at an upstream side and the respective fluid flowing portions 31b and 31c and so forth located at a downstream side so as to gradually enlarge contact area between the bundle Tm and such fluid, thereby, widely spreading the bundle Tm in a progressive manner.

Commenting further, spreading operation is more effectively performed by feeding the multi-filament bundle Tm unwound from the yarn supplier [[1]] 11 with the restrain of being drawn back and changing the tensile force applied to the bundle Tm in carriage alternatively and repeatedly between tension and relaxation by locally and intermittently pressing the bundle Tm in carriage widthwise with regard to the bundle Tm, which operation is by far more effectively performed by providing linearly back-and-forth friction widthwise with regard to the spread bundle Ts discharged from the farthest fluid flowing portion 31c.

Please amend the paragraph beginning at line 34 of page 9 as follows:

Then, the 'apparatus for spreading a multi-filament bundle used in the above method' according to the invention that is adopted as a mechanical means for solving the above issues is

characterized in comprising a yarn supplier 11 such as bobbin, cone, cheese and so forth) or a creel provided with ~~[[or]]~~ a number of such yarn suppliers 11 around which a multi-filament bundle T_m is wound; a multi-filament bundle feeder 2 to unwind and feed the bundle T_m or the respective bundles $T_m \cdot T_m \cdots$ under a certain tensile force from the yarn supplier 11 or the creel 1 with the drawing-back of the bundle T_m or the respective bundles $T_m \cdot T_m \cdots$ in check; a fluid flowing system 3 comprising fluid flowing portions 31a, 31b, 31c and so forth that are disposed in succession along the moving course of the bundle T_m or the respective bundles $T_m \cdot T_m \cdots$ in feed to put a fluid into contact crosswise with regard to and pass the fluid through the bundle T_m or the respective bundles $T_m \cdot T_m \cdots$ in passage with the latter supported thereon in suspension and to bend the bundle T_m or the respective bundles $T_m \cdot T_m \cdots$ towards the direction to which such fluid flows so as to spread the same; a tensile force variable system 4 (refer to Figure 3) to change the tensile force applied to the bundle or the respective bundles in carriage alternatively between tension and relaxation.

Please amend the paragraph beginning at line 22 of page 10 as follows:

Further, the 'apparatus for spreading a multi-filament bundle used in the above method' according to the invention that is adopted as a mechanical means for solving the above issues is

characterized in comprising a yarn supplier 11 or a creel provided with ~~[[or]]~~ a number of such yarn suppliers 11 around which a multi-filament bundle T_m is wound; a bundle feeder 2 to unwind and feed the bundle T_m or the respective bundles $T_m \cdot T_m \dots$ under a certain tensile force from the yarn supplier 11 or the creel 1 with the drawing-back of the bundle T_m or the respective bundles $T_m \cdot T_m \dots$ in check; a fluid flowing system 3 comprising fluid flowing portions 31a, 31b, 31c and so forth that are disposed in succession along the moving course of the bundle T_m or the respective bundles $T_m \cdot T_m \dots$ in feed to put a fluid into contact crosswise with regard to and pass the fluid through the bundle T_m or the respective bundles $T_m \cdot T_m \dots$ with the latter supported thereon and to bend the bundle T_m or the respective bundles $T_m \cdot T_m \dots$ towards the direction to which such fluid flows so as to spread the same; a tensile force variable system 4 to change the tensile force applied to the bundle or the respective bundles in feed alternatively between tension and relaxation and a widthwise back-and-forth friction system 6 to move back and forth widthwise with regard to the bundle T_m or the respective bundles T_m in the process of being spread in abutment with the respective monofilaments comprising the bundle T_m or the respective bundles T_m to apply friction to the respective monofilaments thereof.

Please amend the paragraph beginning at line 16 of page 14 as follows:

Figure 1 is an explanatory side view of an apparatus example 1 used in the method of producing a spread multi-filament bundle according to the first embodiment hereof; Figure 2 is an explanatory plan view of the apparatus example 1 shown in Figure 1; Figure 3 (a) and (b) are illustrations to show the effect on the multi-filament bundle passing through the fluid flowing portions according to the operation of the tensile force variable system; Figure 4 is an explanatory side view of an apparatus example 2 used in the method of producing a spread multi-filament bundle according to the second embodiment hereof; Figure 5 is an explanatory plan view of the apparatus example 2 shown in Figure 4; Figure 6 is an explanatory plan view of the apparatus example 2 used in the method of producing a spread multi-filament bundle according to the third embodiment hereof; Figure 7 is an explanatory side view of an apparatus example 3 used in the method of producing a multi-filament bundle according to the third embodiment hereof; Figure 8 is an explanatory plan view of the apparatus example 3 shown in Figure 7; Figure 9 is an explanatory side view of an apparatus example 4 used in the method of producing a multi-filament bundle according to the third embodiment hereof; Figure 10 is an explanatory plane view of the apparatus example 4 shown in Figure 9; Figure 11 is an explanatory side view of an apparatus example 5 used in the

method of producing a multi-filament bundle according to the third embodiment hereof; Figure 12 is an explanatory side view of an apparatus example 6 used in the method of producing a spread multi-filament bundle according to the third embodiment hereof; Figure 13 is an explanatory side view of an apparatus example 7 used in the method of producing a spread multi-filament bundle according to the fourth embodiment hereof; Figure 14 comprises illustrations showing the state where the spread multi-filament bundles are overlapped one over another and proceed to be formed into a spread multi-filaments sheet according to the fourth embodiment hereof; Figure 15 comprises illustrations showing the state where the spread multi-filaments sheets are overlapped one over another so as to be formed into a commingled spread multi-filaments sheet; Figure 16 is an explanatory side view of an apparatus example 8 used in the method of producing a spread multi-filament bundle according to the fifth embodiment hereof; Figure 17 is an explanatory plan view of the apparatus example 8 shown in Figure 16; Figure 18 is an explanatory side view of an apparatus example 9 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 19 is an explanatory plan view of the apparatus example 9 shown in Figure 18; Figure 20 is an explanatory side view of another apparatus example 10 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 21 is an explanatory plan view of the apparatus

example 10 shown in Figure 20; Figure 22 is an enlarged view of the internal structure of the fluid flowing portion of the apparatus example 10; Figure 23 is a sectional view taken along A-A of Figure 22; Figure 24 is an explanatory side view of another apparatus example 11 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 25 is an explanatory side view of another apparatus example 12 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 26 is an enlarged plan view showing the linkage relation among guide rollers, a crank motor, a crank arm and a linkage mechanism comprising a widthwise back-and-forth friction system of the apparatus example 12 shown in Figure 25; Figure 27 is a structural view showing the mechanism in which the rotary motion of the crank motor is **converged** converted into a widthwise back-and-forth movement transmitted to guide rollers; Figure 28 is an explanatory side view of another apparatus example 13 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 29 is an explanatory side view of another apparatus example 14 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 30 is an explanatory side view of another apparatus example 15 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 31 is an explanatory side view of another

apparatus example 16 used in the method of producing a spread multi-filament bundle according to the sixth embodiment hereof; Figure 32 is an explanatory side view of an apparatus example 17 used in the method of producing a spread multi-filament bundle according to the seventh embodiment hereof; Figure 33 is an explanatory side view of another apparatus example 18 used in the method of producing a spread multi-filament bundle according to the seventh embodiment hereof; and Figure 34 shows a modified example of the third embodiment hereof in which a resin sheet is fused onto the upper and bottom surfaces respectively of the spread multi-filaments sheet so as to produce a pre-impregnation sheet.

Please amend the paragraph beginning at line 19 of page 18 as follows:

The stabilization of the tensile force applied to the bundle T_m that is drawn out from the yarn supplier 11 of the apparatus example 1 is realized as follows. Namely, the tension stabilizing roller 24a of the multi-filament bundle feeder moves upwards when the tension of the bundle T_m in passage is increased while moving downwards when the same is decreased. Then, when the tension stabilizing roller 24a reaches at the upper limit position thereof, the upper limit position sensor 25a detects such position and a signal to that effect is input to the yarn

supply motor 12 to increase the revolving speed of the yarn supplier 11 so as to increase feeding the bundle T_m while to descend the tension stabilizing roller 24a. On the other hand, when the tension stabilizing roller 24a reaches at the lower limit position thereof, the lower limit position sensor 25b detects such position and a signal to that effect is input to the yarn supply motor 12 to decrease the revolving speed of the yarn supplier 11 so as to decrease feeding the bundle T_m . In this way, the tensile force applied to the bundle T_m by use of ~~[[he]]~~ the apparatus example 1 is always kept constant.

Please amend the paragraph beginning at line 6 of page 22 as follows:

A number of the multi-filament bundles T_m are drawn out from the yarn suppliers 11·11· of the creel 1, the respective bundles T_m · T_m · as drawn out being taken up by a multi-filament bundle feeder 2 disposed corresponding to each of those bundles. The basic structure of the portions of the respective multi-filament bundle feeders 2 of the apparatus example 2 corresponding to the respective yarn suppliers 11 is the same as that of the apparatus example 1, which bundle feeder comprises a rotatable guide roller 21 to support a multi-filament bundle T_m unwound and fed from the yarn supplier 11 in a fixed position; a pair of anterior and posterior support rollers 22 and 22

rotatably disposed at a downstream side from the guide roller 21 to support the multi-filament bundles Tm; a tension stabilizing roller 24a rotatably disposed between the support roller ~~[[2]]~~ 22 at an upstream side and the guide roller 21 to abut the multi-filament bundle Tm in passage and to ascend and descend according to change of tensile force applied to the bundle Tm so as to keep the tension of the bundle Tm constant; a upper limit position sensor 25a to detect the upper limit position of the tension stabilizing roller 24a and a lower limit position sensor 25b to detect the lower limit position thereof; a nip roller 23a to press against the support roller 22 at a downstream side and to roll with the bundle Tm sandwiched between itself and the support roller 22 at a downstream side; and a uni-directionally revolving clutch 23b to rotate the nip roller only to a feeding direction of the bundle Tm so as to prevent the bundle from being drawn back. To note, a pair of upper and lower alignment guide rollers 26 and 26 are provided with the apparatus example 2 in addition to the above structural elements, because the respective multi-filament bundles Tm as unwound need to be aligned in parallel in the same elevation level so as to put a group of the respective bundles in order, in view of the fact that the yarn suppliers 11·11· are laid in multi-stages in case of the apparatus example 2. Those guide rollers 26 and 26 are intended for sandwiching therebetween a number of multi-filament bundles Tm unwound from the yarn suppliers 11 in multi-stages in the same elevation level

so as to control the respective bundles such that they are arranged into an orderly aligned group of the bundles $T_m \cdot T_m \dots$ in parallel with each other and in the same elevation level. The provision of those guide rollers 26 and 26 prevents the fluctuation of the tension to which the respective bundles are subjected at a tensile force variable system as described below from affecting an upstream side from those rollers.

Please amend the paragraph beginning at line 5 of page 24 as follows:

Then, the respective multi-filament bundles $T_m \cdot T_m \dots$ that have passed through the alignment guide rollers 26 and 26 move from a fluid flowing spreader 3 via a tensile force variable ~~system~~ system 4 to a take-up roller 5. The arrangement of the multi-filament bundle feeder 2, the fluid flowing spreader 3, the tensile force variable system 4 and the take-up system 5 respectively comprising the apparatus example 2 is substantially the same as that of the apparatus example 1, but the apparatus example 2 is provided with some design modifications in view of a number of bundles T_m (five bundles herein) being subjected to spreading operation. Thus, such modifications are supplemented as follows. To note, the explanation of the multi-filament bundle feeder 2 is omitted to avoid redundancy.

Please amend the paragraph beginning at line 21 of page 28 as follows:

The method of producing a spread multi-filament bundles sheet according to the ~~fourth~~ third embodiment may be carried out also by use of an apparatus example 4 as shown in Figures 9 and 10.

Please amend the paragraph beginning at line 32 of page 28 as follows:

With the ~~fourth~~ third embodiment carried out by use of the apparatus example 4, the respective bundles T_m are subjected to suction air stream with each of those bundles passed under a floating control bridge 35 provided at the respective fluid flowing portions 31a, 31b and 31c. Thus, even if the tensile force applied to the respective bundles T_m passing through those portions is intensified by the action of the tensile force variable system 4 and the like, the respective bundles T_m are abutted onto the floating control bridges 35 so as to be prevented from being straightened or a degree by which the respective bundles T_m are bent from being smaller than secured by the floating control bridges 35. Thus, the minimum contact area between the suction air stream and the respective bundles T_m is secured so that the spreading operation performed thereon at the fluid flowing spreader 3 is stabilized.

Please amend the paragraph beginning at line 13 of page 29 as follows:

Then, the method of producing a spread multi-filament bundles sheet according to the ~~fourth~~ third embodiment may be carried out also by use of an apparatus example 5 as shown in Figure 11.

Please amend the paragraph beginning at line 5 of page 30 as follows:

The method of producing a spread multi-filament bundles sheet according to the ~~fourth~~ third embodiment may be carried out also by use of an apparatus example 6 as shown in Figure 12.

Please amend the paragraph beginning at line 34 of page 30 as follows:

An apparatus example 7 is shown in Figure 13, which apparatus is used for the present embodiment. This apparatus example 7 has an upper and lower arrangement, either of which arrangement is provided with a creel 1, a multi-filament bundle uni-directional feeder 2, a fluid flowing spreader 3, a heater 7 and a guide roller 8, and further comprises a pair of influx rollers 9[[.]], a tensile force variable system 4, a widthwise

back-and-forth friction system 6 provided with bow bars 61 and 61 and a take-up system 5.

Please amend the paragraph beginning at line 21 of page 37 as follows:

Herein, 16 carbon fibers bundles are simultaneously ~~speared~~ spread and consolidated into a spread multi-filament bundles sheet by use of the apparatus example 6 as shown in Figure 12. A carbon fibers bundle 12K marketed under the trade name of 'PYRONFIL TR 50S' manufactured by Mitsubishi Rayon Co., Ltd., in which 12,000 monofilaments respectively having 7 μ m in diameter are bundled, is adopted for the test sample.

Please amend the paragraph beginning at line 10 of page 40 as follows:

As a result of the above test, the respective carbon fibers bundles 12K whose initial width is 5 mm and whose initial thickness is 0.15 mm before being subjected to the spreading operation are processed into the respective spread bundles Ts having 40 mm in width upon passing through the upper and lower fluid flowing spreaders 3. Those spread bundles Ts are fed from the upper and lower fluid flowing spreaders 3 respectively in the form of a spread multi-filaments sheet Tw with the fringe side

monofilaments of any adjacent spread bundles Ts and Ts tangentially aligned and then overlapped one over another at the influx rollers 9 via the respective guide rollers 8, which sheets as overlapped are subjected to back-and-forth friction widthwise thereto by the widthwise back-and-forth friction system 6 so as to be formed into a commingled spread multi-filament bundles sheet Tw with the monofilaments thereof as a whole distributed and intermingled with each other uniformly in density, which commingled sheet has 320 mm in width and 0.04 mm in thickness.

Please amend the paragraph beginning at line 11 of page 41 as follows:

The carbon multi-filament bundle Tm as fed to the fluid flowing spreader 3 moves from an upstream ~~[[aide]]~~ side to a downstream side by passing through the opened suction cavity of the respective fluid flowing portions 31a, 31b, 31c and 31d in which suction air stream with a velocity of 20 m/second is generated. Hereupon, the multi-filament bundle in contact with the suction air stream is bent towards the flowing direction of the suction air so as to increase the contact area between the bundle Tm and the air stream. The enlargement of such contact area permits the air stream to flow through any adjacent monofilaments of the bundle Tm so as to slacken the bonding thereof, which starts spreading the multi-filament bundle. While the bundle Tm moves from the fluid flowing portion 31a at an

upstream side via the fluid flowing portion 31b to the portion 31c at a downstream side, the bundle is gradually being spread and is processed into a spread multi-filament bundle Ts having about 25 mm in width upon passing the portion 31d located at the farthest downstream side.

Please amend the paragraph beginning at line 13 of page 50 as follows:

Figure 29 shows another apparatus 14 that is used in the 'method of producing a spread multi-filament bundles sheet' in accordance with the above sixth embodiment. The difference between this apparatus and the apparatus example 9 lies in that the former is provided with the arrangement such that a prolonged opening of the suction cavity tube with regard to the moving course of the respective bundles is segmented into the respective fluid flowing portions 31a, 31b, 31c and 31d ~~[[are]]~~, and the other structural arrangement thereof is the same as the latter. In comparison with the apparatus example 9, only one suction pump 34 and the sole flow rate adjustment valve 33 are required for the apparatus hereof, which results in reducing the manufacturing cost of the apparatus and facilitating the operation thereof.

Please amend the paragraph beginning at line 21 of page 52 as follows:

Figure 32 shows an apparatus example 17 that is used in the 'method of producing a spread multi-filament bundles sheet' according to the seventh embodiment. Reference numeral 1 therein indicates a creel, to which three bobbins 11 are suspended, and a multi-filament bundle T_m is wound around each of those bobbins. Reference numeral 2 therein indicates a multi-filament bundle feeder, which feeder comprises uni-directionally driving rollers 23 and 23 to unwind the respective bundles T_m from the respective bobbins 11 and to feed them with aligned in parallel in the same plane; a **[[pair]]** streak of anterior and posterior support rollers 21 and 22 intervening between the uni-directionally driving rollers 23 and 23 and the respective bobbins 11 to support the respective bundles T_m in a fixed position; and a tension stabilizing dumper 24 disposed between the pair of support rollers 21 and 22 and provided with a tension stabilizing roller 24a at a lower end portion thereof. The arrangement of the creel 1 and the multi-filaments feeder 2 hereof respectively is the same as that of the apparatus example 9.

Please amend the paragraph beginning at line 2 of page 56 as follows:

In a method of producing a spread multi-filament bundle and an apparatus used in the same according to the invention, such mechanism is adopted as passing in suspension a multi-filament bundle or a number of multi-filament bundles respectively unwound and fed from a supplier or a creel through a plurality of fluid flowing portions disposed in succession along the moving course of the respective bundles to be subjected to fluidal resistance so as to bend towards a direction to which a fluid flows and flowing the fluid through the adjacent monofilaments of the respective bundles whose bonding is slackened due to such fluidal resistance, which mechanism allows a spread multi-filament bundle to be produced with high efficiency while a homogeneous and high-quality spread multi-filament bundles sheet to be mass-produced with the fringe side monofilaments of any adjacent ~~[[t]]~~ bundles tangentially aligned in parallel and the monofilaments thereof distributed uniformly in density, so that the industrial applicability of the invention is very high.

Please amend the Abstract found at page 65 of the specification as follows (a clean copy is attached following page 24 of this paper):

A method of producing a spread multi-filament bundle and an apparatus ~~is used in the same are provided,~~ in which an arbitrary number of multi-filament bundles of higher strength are

simultaneously spread with high speed ~~and facility~~ and a high-quality. A spread multi-filament bundle or sheet with the component monofilaments thereof aligned in parallel widthwise and uniformly distributed in density is produced. ~~with high efficiency.~~

~~Such mechanism is adopted herein as the~~ The respective multi-filament bundles fed from a yarn supplier or a creel ~~being~~ are subjected to the fluctuation of the tensile force applied thereto alternatively between tension and relaxation and the respective bundles as subjected to such fluctuation ~~being~~ are passed in succession through a fluid flowing spreader. ~~comprising a plurality of fluid flowing portions disposed in succession along the moving course of the respective bundles to be subjected to fluidal resistance so as to bend towards the direction to which a fluid flows and the fluid flowing through any adjacent component monofilaments of the respective bundles whose bonding is slackened due to such fluidal resistance so as to widely spread the respective bundles by the mutual action of such change of the tensile force and such fluidal resistance applied thereto.~~